

Neurological researchers find fat may be linked to memory loss

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Although problems with memory become increasingly common as people age, in some persons, memories last long time, even a life time. On the other hand, some people experience milder to substantial memory problems even at an earlier age.

Although there are several risk factors of dementia, abnormal fat metabolism has been known to pose a risk for memory and learning. People with high amounts of [abdominal fat](#) in their middle age are 3.6 times as likely to develop [memory loss](#) and dementia later in their life.

Neurological scientists at the Rush University Medical Center in collaboration with the National Institutes of Health have discovered that the same protein that controls fat metabolism in the liver resides in the memory center of the [brain](#) (hippocampus) and controls memory and learning.

Results from the study funded by the Alzheimer's Association and the National Institutes of Health were recently published in *Cell Reports*.

"We need to better understand how fat is connected to memory and learning so that we can develop effective approach to protect memory and learning," said Kalipada Pahan, PhD, the Floyd A. Davis professor of neurology at Rush University Medical Center.

The liver is the body's major fat metabolizing organ. Peroxisome proliferator-activated receptor alpha (PPARalpha) is known to control

fat metabolism in the liver. Accordingly, PPARalpha is highly expressed in the liver.

"We are surprised to find high level of PPARalpha in the hippocampus of animal models," said Pahan.

"While PPARalpha deficient mice are poor in learning and memory, injection of PPAR? to the hippocampus of PPARalpha deficient mice improves learning and memory", said Pahan.

Since PPARalpha directly controls [fat metabolism](#), people with abdominal fat levels have depleted PPARalpha in the liver and abnormal lipid metabolism. At first, these individuals lose PPARalpha from the liver and then eventually from the whole body including the brain. Therefore, abdominal fat is an early indication of some kind of dementia later in life, according to Pahan.

By bone marrow chimera technique, researchers were able to create some mice having normal PPARalpha in the liver and depleted PPARalpha in the brain. These mice were poor in memory and learning. On the other hand, mice that have normal PPARalpha in the brain and depleted PPARalpha in the [liver](#) showed normal memory.

"Our study indicates that people may suffer from memory-related problems only when they lose PPARalpha in the [hippocampus](#)", said Pahan.

CREB (cyclic AMP response element-binding protein) is called the master regulator of memory as it controls different memory-related proteins. "Our study shows that PPARalpha directly stimulates CREB and thereby increases memory-related proteins", said Pahan.

"Further research must be conducted to see how we could potentially

maintain normal PPARalpha in the brain in order to be resistant to memory loss", said Pahan.

Other Rush researchers involved in this study include Avik Roy, PhD, research assistant professor; Malabendu Jana, PhD assistant professor; Grant Corbett, neuroscience graduate student; Shilpa Ramaswamy, instructor; and Jeffrey H. Kordower, PhD, the Jean Schweppe Armour professor of neurological sciences.

Alzheimer's disease is the most common human disorder associated with memory loss. This disease slowly destroys [memory](#) and thinking skills, and eventually even the ability to carry out the simplest tasks.

Nationwide, the total payments for services for people with Alzheimer's and other forms of dementia will total \$203 billion in 2013. By 2050, the total costs are expected to increase 500 percent to a staggering \$1.2 trillion.

Provided by Rush University Medical Center

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